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The positive eating scale: relationship with objective health parameters and validity in Germany, the USA and India

Gudrun Sproesser[a]*, Verena Klusmann[a], Matthew B. Ruby[b,‡], Naomi Arbit[c], Paul Rozin[b], Harald T. Schupp[d] and Britta Renner[a]

[a]*Psychological Assessment and Health Psychology, University of Konstanz, Konstanz, Germany;* [b]*Department of Psychology, University of Pennsylvania, Philadelphia, PA, USA;* [c]*Department of Nutrition, Columbia University, New York, NY, USA;* [d]*General Psychology, University of Konstanz, Konstanz, Germany*

Objective: The prevailing focus regarding eating behaviour is on restriction, concern, worry and pathology. In contrast, the purpose of the present studies was to focus on a positive relationship with eating in non-clinical samples from Germany, the USA and India.
Design: In Study 1, the Positive Eating Scale (PES) was tested and validated in a large longitudinal sample (T1: $N = 772$; T2: $N = 510$). In Study 2, the PES was tested in online samples from the USA, India and Germany (total $N = 749$).
Main Outcome Measures: Health risk status was measured in Study 1 with objective health parameters (fasting serum glucose, triglycerides, high-density lipoprotein cholesterol, blood pressure, waist circumference, BMI).
Results: Study 1 revealed acceptable psychometric properties of the PES, internal consistency ($\alpha = .87$), as well as test retest reliability after six months ($r = .67$). Importantly, a positive relationship with eating was associated with decreased health risk factors six months later. In Study 2, the structure of the PES was confirmed for German, Indian and US-American adults, suggesting validity across remarkably different eating environments.
Conclusion: A positive relationship with eating might be a fruitful starting point for prevention and intervention programmes promoting physical and psychological health.

Keywords: assessment; cross-country validity; normal eating; objective health parameters; positive relationship with eating

Background

In many parts of the Western world, the prevalence of dieting is high (Polivy & Herman, 1987; Serdula et al., 1999). For many people in the Western world, food and eating has shifted from a major source of pleasure to a source of worry and concern (Rozin, Bauer, & Catanese, 2003; Rozin, Fischler, Imada, Sarubin, & Wrzesniewski, 1999). As a result of people's search for an answer to the question of how to eat appropriately, there are now thousands of recommendations issued by the public media on

*Corresponding author. Email: gudrun.sproesser@uni-konstanz.de
‡La Trobe University, Australia.

how to restrict calorie intake and eat healthily. However, research has shown that diets and restrained eating are often counterproductive and may enhance the risk for long-term weight gain and eating disorders (Mann et al., 2007; Neumark-Sztainer et al., 2006; Stice, Presnell, & Spangler, 2002; van Strien, Herman, & Verheijden, 2014). Similarly, a recent study of people with a weight loss goal found that worry, concern and guilt about eating had negative consequences on their goal attainment. Specifically, people who associated chocolate cake with guilt were less successful at losing or even maintaining their weight in the long term than people who associated chocolate cake with celebration (Kuijer & Boyce, 2014; see also Rozin et al., 1999 for cross-sectional results). Taken together, these results underline the limits of restriction-, concern- and worry-based approaches to diet, and demonstrate the necessity for other routes to maintaining physical and psychological health.

A promising alternative has been to take a positive approach (Gravel et al., 2014; Lohse, Satter, Horacek, Gebreselassie, & Oakland, 2007; Rozin et al., 2003, 1999; Satter, 2007a, 2007b; Vogel & Mol, 2014), focusing on 'normal', non-pathological eating behaviour (Renner, Sproesser, Strohbach, & Schupp, 2012a; Tylka, 2006). Following this idea, we propose the concept of having a positive relationship with eating as a trait, that is, a generic positive evaluation of eating across all eating occasions. Conceptually, this is characterised by being positive about one's eating, similar to the facet Eating Attitude of Satter's (2007a, 2007b) Eating Competence scale, which captures a positive and relaxed eating attitude (other facets of Satter's Eating Competence scale are Food Acceptance, Internal Regulation and Context Skills). Moreover, in addition to being positive about one's eating after eating is finished, a positive relationship with eating is also characterised by positivity when eating, similar to Rozin and colleagues' concept of pleasure derived from food. This involves enjoying food, regarding it as one of the greatest pleasures in life, and thinking of eating as an experience rather than a potential health risk (Rozin et al., 2003, 1999). However, in contrast to Rozin and colleagues' concept, which includes both pleasure from actually *eating* as well as pleasure from seeing, smelling or thinking of *food*, the present studies focus only on a positive relationship with *eating*, because eating is directly relevant to maintaining physical health, whereas seeing, smelling or thinking of *food* is not.

One might argue that it is difficult for people who are positive in and about their eating to follow a healthy diet and maintain health. However, having a positive relationship with eating does not necessarily mean that people constantly indulge in unhealthy foods. In contrast, there is evidence that a positive relationship with eating is even positively associated with healthy eating and health. For instance, people with high eating competence (competent eaters, Satter, 2007a, 2007b), who have, by definition, a positive and relaxed eating attitude, had a higher Healthy Eating Index than less competent eaters (Lohse, Bailey, Krall, Wall, & Mitchell, 2012). Furthermore, people who focused more on the pleasures of food were found to consume fewer unhealthy snacks (de Ridder, Adriaanse, Evers, & Verhoeven, 2014). The association between eating competence and healthy eating patterns might be one reason why competent eaters have been found to have a lower BMI (Lohse et al., 2007), blood pressure, total cholesterol, triglycerides and LDL cholesterol, as well as higher HDL cholesterol than less competent eaters (Psota, Lohse, & West, 2007). Another pathway linking a positive relationship with eating to health parameters might be higher general life satisfaction in 'positive eaters', as life satisfaction is related to health (Strine, Chapman, Balluz, Moriarty, & Mokdad, 2008).

Given these promising links with a positive relationship with eating, a reliable and valid measurement tool is of central importance to its investigation. In the past, a lot of measures have been developed that focus on dieting, restrained eating, worries or concerns about eating. Prominent examples are the Restrained Eating subscale of the Dutch Eating Behavior Questionnaire (van Strien, Frijters, Bergers, & Defares, 1986), the Concern and Worry subscales of the Food-Life Questionnaire (Rozin et al., 1999, 2003) or the Eating Concerns subscale of the Eating Disorder Examination Questionnaire (Fairburn & Beglin, 1994). However, low scores on measures about eating worries or concerns indicate that people are neutral about their eating but not necessarily whether they have a positive relationship with it. Hence, to fully capture people's relation with eating, assessing eating positivity in addition to eating concerns is called for.

A few measures have been developed that take a positive approach. First, the Eating Attitudes subscale of the ecSatter Inventory (Lohse et al., 2007; Satter, 2007a, 2007b; see also Krall & Lohse, 2011) assesses the extent to which people have a positive and relaxed eating attitude. However, the ecSatter Inventory is based on clinical experience and the observation of typical distortions in eating attitudes (Lohse et al., 2007) and therefore may not properly assess healthy individuals' positive relationship with eating. In a similar vein, the Nutrition Quality-of-Life Survey (Barr & Schumacher, 2003) has been developed for people undergoing medical nutrition therapy to assess their quality of life with respect to food intake, for example, enjoying eating without guilt. As such, it might not apply to individuals without any special dietary requirements. Second, the Pleasure subscale of the Food-Life Questionnaire (Rozin et al., 2003, 1999) assesses the enjoyment that people derive from foods. Yet, this does not necessarily measure to what extent one has a positive relationship with eating. Similarly, the Satisfaction with Food-related Life questionnaire (Grunert, Dean, Raats, Nielsen, & Lumbers, 2007) measures one's satisfaction with the *food* that is available, but not how satisfied one is with *eating*. Third, other measures focused on the awareness of or reliance on sensations while eating (e.g. Intuitive Eating Scale; Framson et al., 2009; Tylka, 2006) or on satisfaction with specific characteristics, such as the taste of food (Corle et al., 2001). Again other measures are product-specific, assessing, for example, wellness associated with consuming peppermint (wellness associated with food questionnaire; King et al., 2015).

Taken together, existing measures focus on dieting, restrained eating, worries or concerns about eating, and might thus tap into a different construct than a positive relationship with eating. Furthermore, existing measures with a positive view focus either on a clinical context, pleasure derived from foods, satisfaction with foods or specific attributes of food or awareness while eating. To our knowledge, no measure exists that taps into a general, positive relationship with eating and that focuses on normal, non-pathological eating behaviour. Hence, the aim of the present study was to develop, test and validate a measure to assess people's positive relationship with eating.

Overview

The main goal of the current set of studies was to develop and test a concise and psychometrically sound questionnaire to assess the extent to which people have a positive relationship with eating, the Positive Eating Scale (PES). In Study 1, (1) items were tested in exploratory factor analyses; (2) retest reliability after six months was investigated; (3) construct validity was established; (4) the relationship with demographics was examined;

and (5) predictive validity regarding change in objective health risk status after six months was investigated.

In Study 2, the PES was tested via confirmatory factor analyses. Interestingly, Rozin et al. (1999) found marked country-level differences in the pleasure that people derive from food, with the highest values in their French sample and the lowest values in their US-American sample (see also Fischler & Masson, 2008; Rozin, Remick, & Fischler, 2011 for similar results). The authors conclude that this difference, amongst others, 'may partially account for national differences in rates of cardiovascular diseases' (Rozin et al., 1999, p. 163). Hence, investigating cross-country differences in a positive relationship with eating might also explain why countries differ in diet-related diseases. However, before drawing comparisons between countries, cross-country validity of the measure has to be established (Smith, 2002). Hence, this is another goal of the present study. Criteria for the selection of countries for Study 2 were diversity in terms of eating environment, cuisine, obesity, income and geography (see also Sproesser et al., submitted).

These criteria led to the selection of the USA as an example for a high-income, Western country with a high obesity rate of 34% (World Health Organization, 2015; World Bank, 2016). As a second country, India was selected as an example for a developing country, with the second highest population in the world, from the world's most populous continent, Asia. India has a very low obesity rate of 5% (World Health Organization, 2015; World Bank, 2016). Last, Germany was also included in Study 2 to directly compare findings from the USA and India to the country in which the PES was developed. Germany is a high-income, Western country with a medium obesity rate of 20% (World Health Organization, 2015; World Bank, 2016). Regarding eating environment and cuisine within the three countries, consumption of fruits and vegetables is comparably high in India (11.8% share of dietary energy supply; Germany: 8.6%; USA: 8.9%), whereas consumption of meat and sugar is comparably high in the USA (12.2 and 17.1%; India: .8 and 8.9%) with Germany in between (10.4 and 13.4%; Food and Agriculture Organization of the United Nations, 2014).

Study 1

Methods

Design and procedure

Data were collected as part of the Konstanz Life-Study, a longitudinal cohort study that was launched in spring 2012 with 1,321 participants recruited in Konstanz, Germany (see also Klusmann, Musculus, Sproesser, & Renner, 2016; Renner, Sproesser, Klusmann, & Schupp, 2012b; Sproesser, Klusmann, Schupp, & Renner, 2015, 2017). The Konstanz Life-Study was part of the EATMOTIVE and SmartAct projects which were funded by the Federal Ministry of Education and Research (Grants 01EA1326 and 01EL1420A, granted to B.R. & H.S.). In Wave 1 (T0), 1,321 participants were recruited via flyers, posters and newspaper articles in spring, 2012. Waves 2 (T1) and 3 (T2) took place in autumn 2012 and spring 2013. Participants were invited to re-attend via mail and phone calls. The three measurement points included the collection of blood samples, questionnaires, as well as a standardised check-up including anthropometric measures and functional and cognitive fitness tests. This study presents data of waves 2 (T1) and 3 (T2), in which a positive relationship with eating was assessed.

Sample

At T1, 772 participants provided data on their positive relationship with eating. Of these, 447 (58%) were female. The sample had a mean age of 47.7 years (SD = 17.4, ranging from 19 to 87 years). The mean BMI was 24.8 kg/m^2 (SD = 3.9, ranging from 17.3 to 45.8 kg/m^2). Participants had completed 15.8 years of education on average (SD = 2.4, range from 8 to 20 years, years of school plus years of vocational or university training assessed at T0). Compared with German population data (Statistisches Bundesamt, 2016a, 2016b), this sample was 4 years older, comprised 7% more females, and had a lower average BMI (the average BMI of the German population is 26 kg/m^2 according to Microcensus data from 2009).

At T2, 510 participants re-attended the study (66% of the cross-sectional sample). The longitudinal sample ($N = 510$) did not differ from the drop-out sample ($N = 262$) at T1 in terms of gender (57 vs. 60% women, $\chi^2(1) = .48$, $p = .489$), BMI (24.8 vs. 24.8 kg/m^2, $t(766) = .18$, $p = .861$), education (15.8 vs. 15.6 years, $t(754) = -1.16$, $p = .248$) or positive eating (3.22 vs. 3.21, $t(770) = -.33$, $p = .745$). However, the longitudinal sample was 5 years older than the drop-out sample (49.5 vs. 44.0 years, $t(769) = -4.24$, $p < .001$, $d = .31$).

Ethics, consent and permissions

For data processing and security, a register of processing operations was developed in cooperation with and approved by ZENDAS in 2012 (Zentrale Datenschutzstelle der Baden-Württembergischen Universitäten/Center for Data Protection of the Universities in Baden-Württemberg) and reviewed by the Landesdatenschutz Beauftragte, Baden-Württemberg (Commissioner for Data Protection in Baden-Württemberg) in 2012. In Study 1, participants gave written informed consent prior to the collection of data. In Study 2, participants consented to participate by starting the online survey after being fully informed about the study. For both studies, the research ethics board of the University of Konstanz approved the study protocol. The procedures of both studies were performed in compliance with relevant laws and institutional guidelines. We followed the German Psychological Society's (Deutsche Gesellschaft für Psychologie) guidelines for conducting psychological studies (see http://www.dgps.de/index.php?id=96422; see paragraph C.III). These correspond to those of the American Psychological Association. Both studies conform to the Declaration of Helsinki.

Measures

Generation of items for the PES. The generation of items to assess a positive relationship with eating in healthy individuals was inspired from reviewing previous research and questionnaires, and from discussions with colleagues and experts regarding normal eating behaviour of the department of psychology at the University of Konstanz. Specifically, the Food-Life Questionnaire (Rozin et al., 2003, 1999), ecSatter Inventory (Lohse et al., 2007; Satter, 2007a, 2007b), Intuitive Eating Scale (Tylka, 2006), Nutrition Quality-of-Life Survey (Barr & Schumacher, 2003), Mindful Eating Questionnaire (Framson et al., 2009), Satisfaction with Food-Related Life questionnaire (Grunert et al., 2007), the Quality of Life related to Nutrition questionnaire (Schünemann et al., 2010),

the Quality of Life Factors Questionnaire (Corle et al., 2001), the Food Benefits Assessment (Guyonnet et al., 2008) and the Food Expectancy Questionnaire (Reid, Bunting, & Hammersley, 2005) were reviewed. We took thorough care during item generation that items applied to normal, non-pathological eating behaviour, and tapped into the concept of a positive relationship with eating (as defined in the introduction). Applying both the criteria of content validity and parsimony (Thurstone, 1947; see also Framson et al., 2009 and Lohse et al., 2007), this process resulted in the generation of eight items (see Table 1) with a four-point rating scale from 1 'strongly disagree' to 4 'strongly agree'.

Measures to examine construct validity. Constructs which were assumed to show convergent (habitual motive to eat because of liking or pleasure) or discriminant (restrained eating; habitual motive to eat for reasons of affect regulation or weight control) validity in relation to the PES or which were interesting in terms of health consequences (habitual motive to eat because of health reasons) were selected. Restrained eating was measured at T0 with the respective subscale of the Dutch Eating Behavior Questionnaire (van Strien et al., 1986). This subscale consists of ten items such as 'Do you try to eat less at mealtimes than you would like to eat?' with a five-point rating scale from 1 'never' to 5 'very often' ($\alpha = .88$). Eating motives were assessed with the Brief Eating Motivation Survey (Renner et al., 2012a) at T2 with three items per motive such as 'I eat what I eat because I watch my weight' (Weight Control, $\alpha = .81$), 'I eat what I eat because I am frustrated' (Affect Regulation, $\alpha = .86$), 'I eat what I eat because it is healthy' (Health, $\alpha = .84$), 'I eat what I eat because I enjoy it' (Pleasure, $\alpha = .73$) and 'I eat what I eat because it tastes good' (Liking, $\alpha = .78$). Responses were given on a seven-point rating scale from 1 'never' to 7 'always'.

Table 1. Means (*M*), standard deviations (SD), standardised factor loadings (*a*) and corrected item-scale correlations ($r_{i(t\ i)}$) for items of the Positive Eating Scale (PES) in exploratory factor analysis.

	T1 ($N = 772$)				T2 ($N = 510$)			
	M	SD	*a*	$r_{i(t\ i)}$	*M*	SD	*a*	$r_{i(t\ i)}$
Satisfaction with Eating (*PES-Sat*)	3.14	.54			3.15	.50		
I eat in a way that makes me feel good	3.13	.62	.79	.64	3.17	.62	.70	.58
Overall, I am satisfied with my eating behavior	3.01	.66	.77	.55	3.03	.68	.68	.49
I am relaxed about eating	3.15	.74	.58	.61	3.16	.72	.54	.49
I have a good relationship with eating	3.25	.69	.52	.66	3.27	.63	.74	.69
Pleasure when Eating (*PES-Pl*)	3.37	.58			3.33	.58		
Eating is a pleasure for me	3.39	.63	.94	.64	3.36	.63	.74	.78
I enjoy eating	3.34	.65	.72	.64	3.33	.65	.75	.81
Eating is fun for me					3.29	.67	.99	.86
Eating is something nice for me					3.31	.63	.96	.84
Total PES	3.21	.49			3.24	.47		

Note: A four-point response scale from 1 'strongly disagree' to 4 'strongly agree' was used for the PES.

Eating behaviour and life satisfaction. Eating behaviour was assessed at T2 with a validated Food Frequency Questionnaire (Sproesser et al., 2015; see also Sproesser, Strohbach, Schupp, & Renner, 2011; Winkler & Döring, 1995, 1998). Participants were asked how often on average they eat food items from 15 different selected food categories (e.g. whole meal products, vegetables, fruits, chocolate, cake, meat and salty snacks), ranging from 1 'nearly once a day' to 6 'never'. These 15 food categories were accumulated into a food frequency index reflecting healthy eating with a possible range of 0–30, higher values indicating healthier eating. Life satisfaction was assessed at T2 with the item 'How satisfied are you with your life at present?' (cf. Fujita & Diener, 2005) and responses ranged from 1 'very unsatisfied' to 7 'very satisfied'.

Objective health risk parameters. To investigate the association between a positive relationship with eating and eating-related risk factors for chronic diseases such as diabetes, anthropometric measures and the presence of metabolic syndrome were assessed. Previous research has shown that anthropometric measures such as BMI and metabolic syndrome are related to eating behaviour (Gao et al., 2008; Malik et al., 2010) and are major risk factors for diabetes (International Diabetes Federation, 2006; Romaguera et al., 2011). Measures were taken following standardised procedures by trained research staff at T1 and T2. Participants wore light indoor clothing and were asked to take off their shoes. Height was determined to the nearest .1 cm using a wall-mounted stadiometer. Weight was measured using a digital scale (Omron Body Composition Monitor, BF511) to the nearest .1 kg. BMI was calculated as weight in kilograms divided by height in metres squared. Waist circumference was assessed midway between the lowest rib and the iliac crest with a flexible anthropometric tape (cf. Hara et al., 2006).

Blood pressure was measured two times at the left arm after resting with an automatic oscillometric device (Aponorm Basis Plus) and the second measurement was analysed.

Fasting blood samples were collected in the morning after a minimum of 8-h fast. Fasting serum glucose, triglycerides and high-density lipoprotein (HDL) cholesterol were determined by a certified local laboratory.

The presence or absence of overweight and risk factors for metabolic syndrome were determined using the criteria outlined by the WHO (World Health Organization, 2008) and the International Diabetes Federation (2006). Overweight was defined as having a BMI of 25 kg/m^2 or above. Risk factors for metabolic syndrome were (1) abdominal obesity (waist circumference > 94 cm for men, > 80 cm for women); (2) systolic blood pressure ≥ 130 mm Hg or diastolic blood pressure ≥ 85 mm Hg or use of antihypertensive medications; (3) fasting serum glucose ≥ 100 mg/dl or use of diabetic medications; (4) fasting serum triglycerides ≥ 150 mg/dL or use of lipid-lowering medications; and (5) low fasting serum HDL cholesterol (<40 mg/dl in men, <50 mg/dl in women). Individuals were considered to have metabolic syndrome if they displayed abdominal obesity and at least two additional risk factors.

Analytical procedure

Statistical analyses were conducted using IBM SPSS statistics software (Version 22.0 for Windows). Participants were excluded from data analyses if they filled in less than 75% of the questionnaires at T1 ($n = 27$) and T2 ($n = 37$). Missing data in questionnaire

variables were imputed using the Expectation–Maximization algorithm in SPSS (Gold & Bentler, 2000). Missing data in demographics were not imputed. Missing values were below 5% for all imputed variables. Exploratory factor analyses were conducted using principal axis factoring, which reproduces the initial correlation matrix more reliably than other extraction techniques (Thompson, 2004). Promax rotation ($\kappa = 4$), which allows factors to correlate, was applied. The number of factors to extract was determined by the scree test (Cattell, 1966), Kaiser criterion (Kaiser, 1960), parallel analysis (Horn, 1965; O'Connor, 2000) and Velicer's minimum average partial (MAP) test (O'Connor, 2000; Velicer, 1976). To answer our research questions, Pearson correlations and ANOVAs were computed. Correlations of $r = .1$ were regarded as small, effects of $r = .3$ were regarded as medium, and effects of $r = .5$ were regarded as large (Cohen, 1988, 1992). Moreover, logistic regressions with dummy coded categorical variables and z-standardised continuous variables were performed to investigate the predictive validity of the PES at T1 regarding change in objective health risk parameters from T1 to T2. We chose logistic regressions instead of linear regressions because we were interested in the association between the PES and health risk status which is, by definition, a categorical dependent variable.[1] Specifically, the probability of displaying a health risk parameter at T2 (0 = does not show the risk factor; 1 = shows the risk factor) was predicted through the PES at T1, with all models being adjusted for age, gender and the presence of the health risk parameter at T1 (0 = does not show the risk factor; 1 = shows the risk factor). The presence of the health risk parameter at T1 was included in models to investigate change in risk status from T1 to T2 (Renner, Hankonen, Ghisletta, & Absetz, 2012c; see, for example, Singh-Manoux, Marmot, & Adler, 2005). We adjusted models for age and gender, as these two variables have been found to systematically relate to health parameters (e.g. Schaefer et al., 1994). Including potential confounding variables in the logistic model controls for the impact of these variables and provides an adjusted odds ratio of the independent variable (Kleinbaum & Klein, 2010). To examine whether the PES and its subscales were normally distributed, normal quantile–quantile plots for standardised residuals were inspected (Judd & McClelland, 1989).

Results

Psychometrics of the PES at T1

Examining the distribution of the eight items showed that skewness and kurtosis of all items were acceptable (skewness < |2|; kurtosis < |7|). No pair of items correlated above .85, indicating no severe collinearity restrictions. Global diagnostic indicators showed adequate factorability of the correlation matrix, with Kaiser–Meyer Olkin = .77 and Bartlett's test of sphericity with $\chi^2(28) = 1971.12$, $p < .001$.

The exploratory factor analysis with the eight items suggested three factors with eigenvalues greater than one. The extraction of three factors was also displayed by the parallel analysis of the eigenvalues. The scree plot indicated one factor as did the MAP test. Inspecting the three-factor solution showed that only one item had a high loading on the third factor. However, differences in correlations between items suggested more than one factor. The two-factor solution combined both parsimony and best fit to the data.

As the two items ‘I simply eat what I am up for’ and ‘I do not give too many thoughts to what I eat’ demonstrated low loadings (< .40), they were dropped from further analysis (Bortz & Döring, 2002; Kline, 2011). A factor analysis with the remaining six items showed that the two factors accounted for 58.4% of the variance, with eigenvalues of 3.2 and 1.1. The first factor comprised four items on satisfaction with eating ($\alpha = .80$), and the second factor grouped two items regarding pleasure when eating ($\alpha = .78$). Factor correlation was .50, indicating that the two factors are substantially related but capture meaningfully different components of a positive relationship with eating. Internal consistency of the total scale was .82. Means, standard deviations, loadings and corrected item-scale correlations are displayed in Table 1. German items are displayed in the Supplemental data.

Psychometrics and retest reliability of the PES at T2

As the factor Pleasure when Eating comprised only two items, two new items were generated and included at T2, using the same procedure that resulted in the first set of items (please see Methods section and Table 1). At T2, all items showed acceptable skewness and kurtosis. When examining possible collinearity restrictions, we found that the two items ‘Eating is fun for me’ and ‘Eating is something nice for me’ showed a correlation above .85 ($r = .88$). The determinant of the correlation matrix was significantly different from zero, however, $\chi^2(28) = 3.55$, $p < .001$, refuting severe multicollinearity (Haitovsky, 1969).

The exploratory factor analysis with the eight items yielded two factors with eigenvalues greater than one. The extraction of two factors was also suggested by the parallel analysis of the eigenvalues, the scree plot and the MAP test. The two factors accounted for 62.3% of the variance, with eigenvalues of 4.4 and 1.4, and a correlation between factors of .52. Means, standard deviations, loadings and corrected item-scale correlations are displayed in Table 1. All loadings, corrected item-scale correlations and internal consistencies were acceptable (Satisfaction with Eating, PES-Sat: $\alpha = .76$; Pleasure when Eating, PES-Pl: $\alpha = .92$; total PES: $\alpha = .87$).

Remarkably, despite the long time lag of six months between T1 and T2, retest reliability of the two subscales and the total scale was acceptable.[2] Retest reliability was .64 for the subscale Satisfaction with Eating. For the subscale Pleasure when Eating and the total scale, retest reliability was .70 and .67 when correlating the six items at T1 with the eight items at T2. It was .69 and .68 when correlating the six items at T1 with the same six items at T2. Skewness and kurtosis of the mean scores of the PES, PES-Sat and PES-Pl were acceptable both at T1 and T2 (skewness < |2|; kurtosis < |7|).

Construct validity of the PES and its relationship with healthy eating and life satisfaction at T2

To examine construct validity, correlations between the total PES, the two subscales, as well as eating motives, restrained eating, healthy eating and general life satisfaction were computed (Table 2). The significant positive correlations between the PES and eating foods because of their good taste (i.e. the Liking motive) provided evidence for convergent validity. Interestingly, there was a large correlation with the PES-Pl, whereas the correlation with the PES-Sat was medium-sized. That is, eating foods because of

Table 2. Means (*M*), standard deviations (SD) and correlations of eating motives, restrained eating, healthy eating and life satisfaction with the total Positive Eating Scale (PES) and its subscales Satisfaction with Eating (PES-Sat) and Pleasure when Eating (PES-Pl) at T2 ($N = 510$).

	M	SD	PES	PES-Sat	PES-Pl
TEMS Liking motive	5.55	.75	.41***	.25***	.46***
TEMS Pleasure motive	3.97	1.02	.19***	−.01	.32***
TEMS Affect Regulation motive	2.31	1.11	−.24***	−.36***	−.08
TEMS Health motive	4.86	1.13	.38***	.34***	.32***
TEMS Weight Control motive	3.57	1.32	−.02	−.06	.02
DEBQ restrained eating	2.71	.72	−.04	−.08	−.00
FFQ healthy eating	15.40	3.65	.19***	.25***	.08
Life satisfaction	4.97	1.41	.12**	.17***	.05

Notes: A seven-point response scale from 1 'never' to 7 'always' was used for the eating motives, a five-point scale from 1 'never' to 5 'very often' for restrained eating and a seven-point scale from 1 'very unsatisfied' to 7 'very satisfied' for life satisfaction. Healthy eating comprises an index with possible values ranging from 0 to 30, with higher values indicating healthier eating. TEMS – The Eating Motivation Survey; DEBQ – Dutch Eating Behavior Questionnaire; FFQ – Food Frequency Questionnaire.
**$p < .01$; ***$p < .001$.

their good taste was more related to Pleasure when Eating than to Satisfaction with Eating. A similar pattern emerged for eating foods for pleasure (i.e. the Pleasure motive). This motive showed a medium-sized correlation with the PES-Pl, but no association with PES-Sat.

Moreover, the PES was significantly negatively related to eating to regulate negative affect, whereby this time the correlation was driven by the PES-Sat, whereas the PES-Pl was unrelated to the Affect Regulation motive. That is, people who ate more often to regulate negative affect were less relaxed about their eating than people who did this less often, but eating to regulate negative affect was independent of Pleasure when Eating. Furthermore, it is important to note that the PES and its subscales were significantly positively correlated with the motive to eat foods for health reasons. Additionally, the PES and its subscale Satisfaction with Eating were positively associated with healthy eating behaviour, whereas the subscale Pleasure when Eating was not. This supports the notion that people with a positive relationship with eating do not indulge in unhealthy foods, but actually choose healthy foods for health reasons more often than people with a less positive relationship with eating. Lastly, the PES and its subscales were unrelated to eating foods to control one's weight and restrained eating, therefore indicating discriminant validity. The PES showed a small positive correlation with general satisfaction with life, whereby this relationship was mainly driven by the subscale Satisfaction with Eating.

Positive eating: relation with gender, age and education

As a control analysis, the relationship of the PES with demographics at T2 was investigated. The total PES, as well as the subscale Satisfaction with Eating, were unrelated to gender, PES: $M_{women} = 3.3$, SD = .5; $M_{men} = 3.2$, SD = .5; $F(1, 504) = .63$, $p = .428$; PES-Sat: $M_{women} = 3.1$, SD = .5; $M_{men} = 3.2$, SD = .5; $F(1, 504) = .96$, $p = .327$. However, women had a slightly higher score on the subscale Pleasure when Eating than did men, PES-Pl: $M_{women} = 3.4$, SD = .6; $M_{men} = 3.3$, SD = .6; $F(1, 504) = 4.62$, $p = .032$, $\eta^2_p = .01$.

Furthermore, the total PES was unrelated to age ($r = -.02$, $p = .606$), whereas the PES-Sat showed a small positive correlation ($r = .12$, $p = .010$), and the PES-Pl a small negative correlation ($r = -.14$, $p = .002$). Hence, Satisfaction with Eating slightly increased with age, whereas Pleasure when Eating slightly decreased. The total PES as well as its subscales were unrelated to years of education (total PES: $r = .09$, $p = .053$; PES-Sat: $r = .08$, $p = .079$; PES-Pl: $r = .07$, $p = .106$).

Positive eating: prediction of health risk status

Binary logistic regression analyses were performed to investigate the relationship between the PES and its subscales at T1, and change in risk for overweight and indicators of metabolic syndrome from T1 to T2 (see Table 3 and Figure 1).

The first seven regressions tested the *impact of the total PES* on the change of the risk for being overweight and indicators of metabolic syndrome. Compared with participants with a less positive relationship with eating, participants with a more positive relationship with eating had a significantly lower risk of an elevated waist circumference, elevated fasting serum glucose and a lower risk for metabolic syndrome (see Table 3 and Figure 1). There was no significant impact of a positive relationship with eating on the change in risk of being overweight, hypertensive, displaying low HDL cholesterol or elevated fasting serum triglycerides. To further test whether the PES explains risk factors over and above socio-demographic indicators, the difference in the log-likelihood was computed between the models containing age, gender and risk at T1 and the models containing these three parameters and the PES (Tabachnick & Fidell, 2014). The results confirmed the findings above with a significantly lower log-likelihood in the models including the PES. Specifically, including the PES significantly decreased the log-likelihood in the models predicting risk of an elevated waist circumference ($\Delta - 2LL = 4.41$, $df = 1$, $p = .036$), elevated fasting serum glucose ($\Delta - 2LL = 4.40$, $df = 1$, $p = .036$) and risk for metabolic syndrome ($\Delta - 2LL = 10.00$, $df = 1$, $p = .002$).

The next seven regression analyses tested the *joint impact of the two subscales of the PES* on the change in the risk for being overweight and indicators of metabolic syndrome (see Table 3 and Figure 1). Compared with participants with lower Satisfaction with Eating, participants with higher Satisfaction with Eating had a significantly lower risk of an elevated waist circumference, low HDL cholesterol and a lower risk for metabolic syndrome. There was no significant impact of Satisfaction with Eating on the change in the risk for being overweight, hypertensive or displaying elevated fasting serum triglycerides or serum glucose. Interestingly, the subscale Pleasure when Eating was not related to any change in health risk indicators. Again, the difference in the log-likelihood was computed between the models containing age, gender, risk at T1 and the PES-Pl and the models containing these four parameters and the PES-Sat (Tabachnick & Fidell, 2014). The results confirmed the findings above with a significantly lower log-likelihood in the models including the PES-Sat. Specifically, including the PES-Sat significantly decreased the log-likelihood in the models predicting risk of an elevated waist circumference ($\Delta - 2LL = 5.62$, $df = 1$, $p = .018$), risk of low HDL cholesterol ($\Delta - 2LL = 4.25$, $df = 1$, $p = .039$) and risk for metabolic syndrome ($\Delta - 2LL = 8.50$, $df = 1$, $p = .004$).

Table 3. Results of the logistic regression analyses of the total Positive Eating Scale (PES) or its subscales Satisfaction with Eating (PES-Sat) and Pleasure when Eating (PES-Pl) at T1 predicting the change in health risk status from T1 to T2 ($N = 510$).

	PES					PES-Sat					PES-Pl				
Health risk at T2 (*n* at risk[a])	*B*	SE	Wald	*df*	*p*	*B*	SE	Wald	*df*	*p*	*B*	SE	Wald	*df*	*p*
BMI ≥ 25 kg/m^2 (207)	−.34	.22	2.52	1	.112	−.11	.27	.15	1	.699	−.30	.27	1.21	1	.271
Waist circumference > 94/80 cm (243)	−.30	.15	4.25	1	.039	−.45	.19	5.31	1	.021	.14	.19	.53	1	.468
Blood pressure ≥ 130/85 mm Hg (185)	−.10	.13	.60	1	.440	−.14	.16	.69	1	.405	.03	.16	.04	1	.838
HDL cholesterol < 40/50 mg/dl (35)	−.29	.22	1.74	1	.188	−.55	.26	4.42	1	.036	.28	.26	1.09	1	.297
Triglycerides ≥ 150 mg/dL (77)	−.24	.15	2.44	1	.118	−.08	.20	.15	1	.698	−.19	.19	1.05	1	.304
Glucose ≥ 100 mg/dl (45)	−.37	.18	4.39	1	.036	−.32	.23	1.86	1	.173	−.09	.23	.16	1	.690
Metabolic syndrome (63)	−.54	.17	9.94	1	.002	−.64	.22	8.52	1	.004	.06	.21	.08	1	.782

Notes: The probability of displaying a health risk parameter at T2 was predicted through positive eating at T1, with all models being adjusted for age, gender and the probability of displaying the health risk parameter at T1.

[a]Numbers in parentheses refer to the number of participants who showed a risk factor at T2. For instance, 207 participants had a BMI of 25 kg/m^2 or higher at T2.

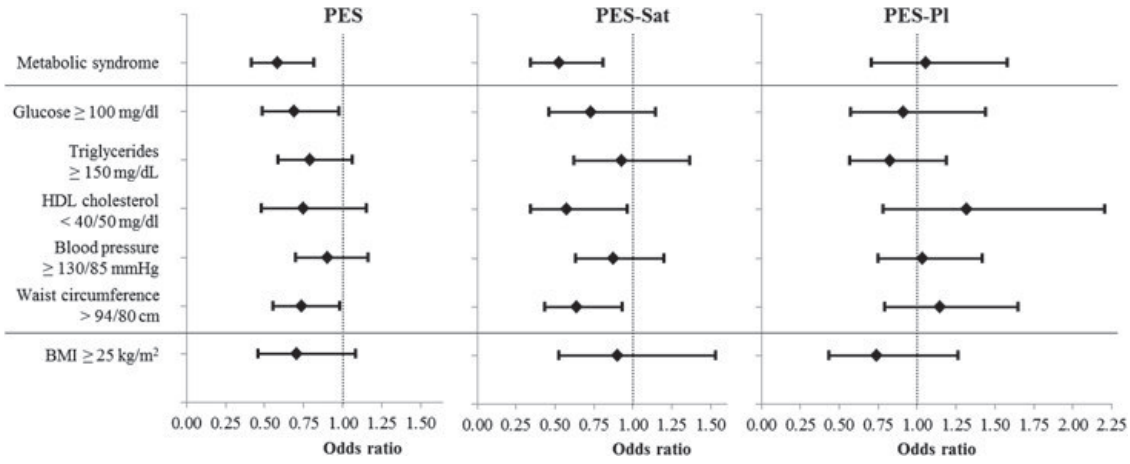

Figure 1. PES and subscales at T1 predicting change in health risk status from T1 to T2.
Note: Error bars indicate 95% confidence intervals; PES Positive Eating Scale; PES-Sat Satisfaction with Eating; PES-Pl Pleasure when Eating.

Taken together, in Study 1 we developed and tested the Positive Eating Scale in a German longitudinal sample. Study 2 aimed at confirming the structure of the PES in samples from Germany, India and the USA to investigate its validity across remarkably different eating environments.

Study 2

Methods

Sample

Data were collected as part of an international project on psychological factors underlying eating behaviour (Arbit et al., submitted; Sproesser et al., submitted). In total, 887 participants took part in an online survey (Germany: 357; India: 326; USA: 204; Unipark survey software, Globalpark AG, Hürth, Germany). Out of these, 138 participants (16%) filled out less than 75% of the survey, or failed two or more attention checks (see Procedure and Material). These participants were excluded from analysis. Sample characteristics of the remaining 749 participants are displayed in Table 4. The German sample included more women; BMI was the highest in US-American sample. Noticeably, the Indian sample had a higher average BMI than the Indian population (20–21 kg/m^2, depending on the social group; Government of India, 2016a) and rated their SES slightly higher than middle in their country. As 27.5% of Indians fall below the poverty line (Government of India, 2016b), these individuals are probably underrepresented in the Indian sample.

Comparing the study sample with the drop-out sample showed no significant differences in terms of gender, 54 vs. 58% females, $\chi^2(2) = 1.82$, $p = .402$. However, the study sample was slightly older, 35 vs. 32 years, $F(1, 863) = 4.35$, $p = .037$, $\eta^2_p = .01$, had a higher BMI, 25 vs. 23 kg/m^2, $F(1, 827) = 4.33$, $p = .038$, $\eta^2_p = .01$ and lower SES, 5.3 vs. 5.9, $F(1, 861) = 17.00$, $p < .001$, $\eta^2_p = .02$, than the drop-out sample. Moreover, 56% of the drop-out sample ($N = 78$) provided data on the PES. This part of the drop-out sample had slightly lower scores on the PES than the study sample, 3.05 vs. 3.20, $t(825) = 2.76$, $p = .006$, $d = .33$.

Table 4. Socio-demographic characteristics of the sample and differences between countries.

	Pooled sample (N = 749)	Germany (n = 297)	India (n = 254)	The USA (n = 198)	χ^2 or F	df	p	Cramer's V or η^2_p
% female	54%	81%[a]	32%	43%	153	4	<.001	.45
Mean age in years (SD)	35 (12.5)	36 (14.8)	34 (10.3)	35 (11.1)	1.11	2, 746	.329	
Mean BMI in kg/m^2 (SD)	24.7 (5.5)	23.7 (4.7)	24.3 (4.8)	26.7 (6.8)	19.45	2, 728	<.001	.05
Mean SES (SD)	5.3 (1.4)	5.9 (1.2)	5.5 (1.2)	4.3 (1.3)	96.74	2, 746	<.001	.21

Notes: SES was measured with a question adapted from the Cantril ladder (Cantril, 1965) where people are asked to rate where they stand in their society in their country from 1 (people with least money, education, and worst jobs) to 9 (people with most money, education, and best jobs).
[a]Please note that any effect of the unequal gender distribution between countries is negligible as the PES measurement model was invariant across gender in Study 1 at T2 (please see Supplemental data).

Procedure and material

In India and the USA, participants were recruited via Amazon.com's Mechanical Turk, a marketplace for online tasks (Buhrmester, Kwang, & Gosling, 2011). Participants received $2 for completing the questionnaire. As Germans are not readily available through Mechanical Turk, German participants were invited to the study through an e-mail sent to several mailing lists. In Germany, participants were free to forward the link to their acquaintances in order to recruit additional participants. As incentive for German participants, 10 vouchers for Amazon, worth 10€ each, were awarded by lottery.

For Indian and US-American participants, the German PES items were translated into English using a collaborative, iterative approach (Douglas & Craig, 2007). Specifically, four bilingual translators made independent, parallel translations of the German PES into English. A review meeting was then held in which the translators discussed the four versions and decided on a version for final review. Afterwards, this version was pretested qualitatively by getting feedback about comprehension, clarity and coverage. To guard against careless responding, three attention checks were included in the questionnaire ('I regularly eat rocks', 'I enjoy eating plastic' and 'I think that the earth is a cube'.).

Analytical procedure

Statistical analyses were conducted using IBM SPSS and AMOS (Version 22.0 for Windows). Missing data in the questionnaire were imputed using the Expectation–Maximization algorithm in SPSS (Gold & Bentler, 2000). Missing values were below 5% for all imputed variables. Item distributions were inspected for multivariate normality. Skewness and excess of all items were below the thresholds of 2 and 7, respectively, as suggested by Curran, West, and Finch (1996). Since the items did not correlate above .85, no marked collinearity restrictions existed. Confirmatory factor analyses (CFAs) using maximum likelihood solutions were conducted. The item with the highest factor loading was fixed to 1.0 for each factor, respectively. Model fit was

assessed by the comparative fit index (CFI), the standardised root mean squared residual (SRMR) and the root-mean-square error of approximation (RMSEA), as recommend by Kline (2011). The CFI constitutes an incremental fit index which measures the proportionate improvement in fit by comparing the target model with a null model in which all observed variables are uncorrelated (Hu & Bentler, 1999). In contrast, the RMSEA and SRMR are absolute fit indices, comparing the target model to a saturated model that exactly reproduces the sample covariance matrix (Hu & Bentler, 1999). A reasonable fit is indicated by a CFI ≥ .90, an SRMR value ≤ .10 and an RMSEA value ≤ .08 (Kline, 2011; note that Hu & Bentler, 1999 suggest a CFI ≥ .95, an SRMR value ≤ .08 and an RMSEA value ≤ .06 for a good fit). Because the χ^2 statistic is sample size-dependent, the χ^2/df ratio was additionally calculated with a χ^2 not larger than 2–5 times the degrees of freedom indicating a good fit (Bollen & Long, 1993; please note that Carmines & McIver, 1981, suggest that a χ^2 not larger than 3 times the degrees of freedom indicates a good fit).

Results

Means, standard deviations, standardised factor loadings and corrected item-scale correlations of all items for the full sample and for the three countries are listed in Table 5. Fit statistics for the model with two correlated factors are displayed in Table 6. All items showed a statistically significant factor loading ($p < .001$), indicating convergent validity. Only 1 out of 32 item loadings was below the recommended level of .30 (Kline, 2011), that is, 'Overall, I am satisfied with my eating behavior' in the Indian sample.

Internal consistencies were acceptable (full sample: total PES $\alpha = .84$; Satisfaction with Eating $\alpha = .78$; Pleasure when Eating $\alpha = .86$; German sample: total PES $\alpha = .88$; Satisfaction with Eating $\alpha = .82$; Pleasure when Eating $\alpha = .92$; Indian sample: total PES $\alpha = .77$; Satisfaction with Eating $\alpha = .59$; Pleasure when Eating $\alpha = .69$; US-American sample: total PES $\alpha = .85$; Satisfaction with Eating $\alpha = .80$; Pleasure when Eating $\alpha = .87$). Only the subscale Satisfaction with Eating showed a suboptimal internal consistency in the Indian sample, due to a low corrected item-scale correlation of the item 'Overall, I am satisfied with my eating behavior' (see Table 5). Correlation between the PES subscales was .47 within the total sample, .50 within the German sample, .59 within the Indian sample and .46 within the US-American sample.

As Table 6 shows, model fit within the three countries and for the total sample varied from moderate to good. The chi-square statistics were significant ($p < .001$), indicating no exact fit of the model, which is to be expected considering the large sample sizes (Kline, 2011). The SRMR indicated a reasonable approximate model fit within all countries. Similarly, the CFI indicated a reasonable model fit within the total, German and Indian sample. Only in the US-American sample (CFI = .88) it was slightly below the recommended threshold of .90 (Kline, 2011). The χ^2/df ratio indicated a good model fit in the German and Indian sample. However, values were above $\chi^2/df = 5$ in the total ($\chi^2/df = 7.03$) and US-American ($\chi^2/df = 5.82$) sample. Last, the RMSEA was only below the recommended .08 within the Indian sample.

In a next step, modification indices were inspected to investigate why model fit in the US-American sample was worse than in the German and Indian sample. These indicated correlated errors of the items 'Eating is a pleasure for me' and 'I enjoy eating' as

Table 5. Means (*M*), standard deviations (SD), standardised factor loadings (*a*) and corrected item-scale correlations ($r_{i(t-i)}$) for items of the PES in confirmatory factor analysis.

	Total (N = 749)				Germany (n = 297)				India (n = 254)				USA (n = 198)			
	M	SD	*a*	$r_{i(t-i)}$	*M*	SD	*a*	$r_{i(t-i)}$	*M*	SD	*a*	$r_{i(t-i)}$	*M*	SD	*a*	$r_{i(t-i)}$
Satisfaction with Eating	3.10	.52			3.15	.59			3.18	.38			2.92	.51		
I eat in a way that makes me feel good	3.11	.63	.64	.59	3.14	.65	.66	.64	3.23	.59	.60	.44	2.91	.61	.64	.58
Overall, I am satisfied with my eating behavior	2.99	.69	.54	.51	3.00	.75	.61	.58	3.13	.59	.24	.20	2.81	.70	.64	.59
I am relaxed about eating	3.14	.66	.69	.58	3.15	.79	.73	.66	3.18	.54	.61	.45	3.06	.58	.69	.55
I have a good relationship with eating	3.15	.69	.83	.65	3.28	.75	.89	.70	3.17	.57	.64	.41	2.91	.67	.86	.72
Pleasure when Eating	3.30	.56			3.55	.55			3.06	.48			3.22	.51		
Eating is a pleasure for me	3.31	.72	.77	.71	3.62	.60	.81	.78	3.05	.74	.61	.51	3.18	.70	.80	.75
I enjoy eating	3.41	.60	.71	.64	3.53	.61	.81	.77	3.27	.60	.57	.40	3.40	.53	.74	.70
Eating is fun for me	3.16	.75	.79	.73	3.52	.63	.88	.84	2.78	.75	.55	.50	3.10	.63	.84	.75
Eating is something nice for me	3.32	.61	.84	.74	3.55	.62	.92	.86	3.16	.57	.68	.53	3.20	.52	.79	.70

Note: A four-point response scale from 1 ‘strongly disagree’ to 4 ‘strongly agree’ was used for the PES.

Table 6. Goodness-of-fit indices for models of the Positive Eating Scale for the full sample ($N = 749$) and for the three countries (Germany: $n = 297$; India: $n = 254$; USA: $n = 198$).

	χ^2	*df*	χ^2/df	CFI	SRMR	RMSEA	90% CI
Full version (*8 items, 2 factors*)							
Total	133.47	19	7.03	.95	.048	.090	.076−.104
Germany	78.58	19	4.14	.96	.055	.103	.080−.127
India	48.98	19	2.58	.93	.050	.079	.052−.107
The USA	110.62	19	5.82	.88	.083	.156	.129−.185
Reduced version (*6 items, 2 factors*)							
Total	33.33	8	4.17	.98	.036	.065	.043−.089
Germany	22.91	8	2.86	.99	.039	.079	.042−.118
India	15.78	8	1.97	.97	.038	.062	.008−.107
The USA	22.31	8	2.79	.97	.053	.095	.050−.143

Note: All χ^2 are significant at $p < .001$.

well as of the items ‘Eating is a pleasure for me’ and ‘Eating is something nice for me’. Additionally, a double loading of the item ‘I eat in a way that makes me feel good’ on both factors was indicated. After deleting the two items ‘Eating is a pleasure for me’ and ‘I eat in a way that makes me feel good’, model fit was improved (reduced version, see Table 6).

With regard to construct validity, relationship with demographics and healthy eating, as well as the prediction of change in health risk status, control analyses showed that the reduced version of the PES (PES6) revealed highly comparable results to the eight-item version in Study 1 (please see Supplemental data, Tables S1 and S2). For instance, in line with results presented in Study 1, the PES6 was significantly associated with lower probabilities of displaying an elevated waist circumference, OR = .72, 95% CI [.54–.97], elevated fasting serum glucose, OR = .69, 95% CI [.48–.98] and metabolic syndrome, OR = .60, 95% CI [.43–.84]. Likewise, the subscale Satisfaction with Eating of the PES6 was significantly associated with lower probabilities of displaying an elevated waist circumference, OR = .68, 95% CI [.46–.99], low HDL cholesterol, OR = .46, 95% CI [.27–.78] and metabolic syndrome, OR = .53, 95% CI [.34–.82].

Discussion

The present study aimed to develop, test, and validate a measure of people’s positive relationship with eating. Moreover, cross-country validity was examined. Two substantially correlated subfactors were found to underlie the PES, namely Satisfaction with Eating and Pleasure when Eating. Psychometric properties of the PES, internal consistency as well as test–retest reliability after six months were acceptable. Construct validation provided evidence for convergent and discriminant validity. Specifically, the PES was positively related to eating motives that address eating because of a good taste or positive emotions and negatively related to eating to regulate negative affect. Interestingly, the PES was positively related to eating for health reasons and healthy eating. Moreover, it was independent of restrained eating and the motive to control one’s body weight, providing evidence for discriminant validity. There was a small significant positive correlation between the PES and general life satisfaction. Furthermore, women and younger people had a slightly higher score on Pleasure when Eating than men as well

as older people, whereas the latter displayed a higher Satisfaction with Eating. Importantly, higher PES scores were associated with a lower risk for an enhanced waist circumference, enhanced blood glucose and a lower risk for metabolic syndrome. These effects were mainly driven by the subscale Satisfaction with Eating. Last, confirmatory factor analyses showed good psychometric properties for the German PES. A reduced six-item version of the English PES was also valid across samples from India and the USA, countries which are characterised by remarkably different eating environments.

Conceptually, the PES describes a positive relationship with eating, focusing on normal, non-pathological eating behaviour. Thus, it builds on previous research that has examined positive approaches to eating (Gravel et al., 2014; Lohse et al., 2007; Rozin et al., 2003, 1999; Satter, 2007a, 2007b; Vogel & Mol, 2014), and that has focused on normal eating behaviour (Renner et al., 2012a; Tylka, 2006). Moreover, it complements existing measures of positive aspects about eating that, different to the PES, focus on a clinical context (Barr & Schumacher, 2003; Lohse et al., 2007; Satter, 2007a, 2007b), the pleasure derived from foods (Rozin et al., 1999, 2003), satisfaction with foods or specific attributes of food (Corle et al., 2001; Grunert et al., 2007; King et al., 2015) or awareness while eating (Framson et al., 2009; Tylka, 2006). To go beyond these conceptual differences between the PES and these measures, future research should provide empirical evidence on the association between these measures and the PES. Furthermore, it will be interesting to see how the PES relates to general measures of emotional competence (e.g. Petrides & Furnham, 2003).

It is important to note that the PES showed no significant correlation with restrained eating or with the motive to control one's body weight. In a similar vein, de Ridder et al. (2014) found no relation between focusing on the pleasures of food and restrained eating. Hence, restrained and positive eating are two independent constructs, rather than the two ends of a continuum, which is in line with findings showing that positive and negative affects are largely independent (Lucas, Diener, & Suh, 1996; Watson, Clark, & Tellegen, 1988). Notably, although the level of restrained eating within the sample of Study 1 was comparable to other studies (e.g. Ouwens, van Strien, & van der Staak, 2003; van Strien, Herman, Engels, Larsen, & van Leeuwe, 2007), mean levels of positive eating were rather high ($M = 3.2$ on a scale from 1 to 4). It is an interesting future research question whether restrained eaters who are at the same time positive about their eating are more successful dieters than restrained eaters who are not positive about their eating (see also Fishbach, Friedman, & Kruglanski, 2003).

The findings in this study regarding the links of the PES to health motives, healthy eating and objective health indicators may encourage new directions for interventions for healthy eating behaviour. Instead of practicing self-regulation and restraint, it might be an alternative to foster positivity about and when eating. We have previously demonstrated that health promotion via positive emotional rewards can be effective in the context of exercise and physical activity (Klusmann et al., 2016; Klusmann, Evers, Schwarzer, & Heuser, 2012).

Positivity about and when eating

The two subscales of the PES differ in proximity to eating behaviour. Pleasure when Eating assesses positivity in the moment of eating, whereas Satisfaction with Eating captures whether people are still positive about their eating when eating is finished.

Against this background the differential associations with validation constructs, healthy eating, change in health risk and age can be summarised into a coherent and systematic pattern. First, both the Pleasure motive and the subscale Pleasure when Eating focus on pleasure in the moment of eating. This can explain why these two measures were associated in the present studies, whereas no association was found between the Pleasure motive and the subscale Satisfaction with Eating.

Second, Satisfaction with Eating was linked to healthy eating, objective health parameters (i.e. waist circumference, HDL cholesterol, metabolic syndrome) and life satisfaction, whereas Pleasure when Eating was not. This makes sense given that Satisfaction with Eating depicts a general positive appraisal of one's eating. The association between Satisfaction with Eating and both healthy eating and health parameters is also in line with the existing literature. Specifically, competent eaters displayed a healthier eating pattern (Lohse et al., 2012) and superior cardiovascular biomarkers than less competent eaters (Psota et al., 2007). Conceptually, the facet Eating Attitude within the construct Eating Competence (Satter, 2007a, 2007b) is more similar to the PES subscale Satisfaction with Eating than to the subscale Pleasure when Eating as it targets more the positivity about eating than when eating.

It is, however, important to note that only two of the final four-item PES-Pl could be used to predict health parameters. Hence, future research still needs to assess the predictive validity of the four-item PES-Pl as well as of the full PES. Moreover, future intervention studies, which would allow for causal inferences, need to explore whether healthy eating and life satisfaction actually explain the link between Satisfaction with Eating and better health. Also, the processes explaining why people who are satisfied with their eating display healthier eating behaviour need to be elucidated. Specifically, people who are satisfied with their eating might differ from people who are less satisfied in the cognitive processes underlying the way they perceive, process and react to food-related information. For instance, they might show a weaker attentional bias towards high-caloric foods (cf. Meule & Platte, 2016).

Third, although the correlations of the PES subscales and age were small, the opposing direction of these correlations seems logical when referring to the literature on life span affective development: while general life satisfaction and well-being increase with age, extreme emotional peaks and the occasions of acute positive affect decrease (Diener & Eunkook Suh, 1998). This can explain why with increasing age people get more satisfied with their eating, but simultaneously experience less pleasure when eating. This finding is also in line with previous findings that competent eaters were older than less competent eaters (Satter, 2007a, 2007b), whereas eating because of positive emotions was more pronounced in younger individuals (Renner et al., 2012a).

Positive eating in Germany, the USA and India

Overall, psychometric properties of the German PES were acceptable. Within the English PES, two items appeared to be suboptimal. The suggested double loading of the item 'I eat in a way that makes me feel good' might be due to differences in the English and German wording. Specifically, whereas the German wording 'Ich esse so, wie es mir gut tut' targets physical well-being, the English wording might also include psychological well-being. This might explain why this item cross-loaded on the subscale Pleasure when Eating. Moreover, in the Indian sample, the item 'Overall, I am

satisfied with my eating behavior' had a low loading. Future research is needed to elucidate the interpretation of these items, for example, by running cognitive interviews.

Study 2 focused on the cross-country validity of the PES, which needs to be distinguished from mean differences between countries. Whereas, mean differences between countries are biased by sample differences (e.g. in gender, SES or BMI), the performed within-country correlations are not (Heine, 2008). Nevertheless, some interesting mean differences between countries were observed that require future investigation and statistical validation. For instance, the USA sample showed the lowest Satisfaction with Eating, which is in line with findings from Rozin et al. (1999). Specifically, US Americans, 'who do the most to alter their diet in the service of health' (Rozin et al., 1999, p. 163), were least likely to classify themselves as healthy eaters, and were most concerned and worried about their eating, in comparison to European and Japanese people. Furthermore, Germans scored the highest on Pleasure when Eating, which is in line with the comparably low pleasure that US Americans derive from food (Rozin et al., 1999) and with our finding that Germans had higher scores on eating because of a good taste than Indians and US Americans (Sproesser et al., submitted).

It is, however, important to note that samples in Study 2 were not representative. For instance, the fact that Indian participants in Study 2 completed the English version of the PES has likely led to an overrepresentation of wealthy Indians with English skills. Hence, differences between samples may not be unconditionally interpreted as coming from different cultural backgrounds. Results from the Indian sample should be replicated in a more representative sample.

Further positive aspects of eating

The present studies aimed to capture the concept of having a positive relationship with eating, that is, being positive about and when eating. However, there are certainly more positive aspects of eating. First, next to positivity about and when eating, positive anticipations, experiences and memories of eating might be of interest (cf. Kahneman, Fredrickson, Schreiber, & Redelmeier, 1993; Kahneman, Wakker, & Sarin, 1997; Rode, Rozin, & Durlach, 2007). A second positive aspect of eating that was not included in the PES is the meaning that people get from their relationship to food, for example, feeling good or fulfilled because of using eating to make the world a better place, or as a way to connect to other people (Arbit et al., submitted; Bratanova et al., 2015; Rozin, 1996, 2005). Third, people's social lives are in a rich two-way relationship with eating (Fischler, 2011; Fischler & Masson, 2008) and, thus, can be regarded as another positive aspect of eating. These aspects should be investigated in future studies.

Limitations

Some limitations of the present set of studies need to be taken into account. First, despite the fact that our sample in Study 1 was representative of the German population in terms of gender, BMI and age (Statistisches Bundesamt, 2016a, 2016b), findings are limited by drop-outs which might have led to a selective sample of health-interested individuals. Moreover, in Study 2, samples were not representative, oversampling, for

example, wealthy Indians with English skills and access to the internet. Second, although a positive relationship with eating predicted a change in health risk status, the predictor variable was static. However, to understand what actually drives risk status changes, we need to study whether *changes* in predictors are followed by changes in risk status (Renner et al., 2012c). Hence, future intervention studies are needed to determine whether a change in a positive relationship with eating leads to a subsequent change in health risk. Third, the fact that Indian participants in Study 2 completed the English version of the PES might have resulted in some noise in the data due to imperfect understanding of questions. Although we included attention (and understanding) checks in the questionnaire, imperfect understanding of some wording might explain why correlations in the Indian sample tended to be the lowest. It is also important to note that no back-translation was created after translating the PES into English; instead a collaborative, iterative approach was used (Douglas & Craig, 2007). Future research needs to determine whether similar findings are obtained in representative samples, intervention studies and with translations of the PES into further languages.

Conclusion

In the light of the limits of a restriction, concern, worry and pathological focus on eating behaviour, the present manuscript took an alternative approach, focusing on a positive relationship with eating in a non-clinical sample. A concise and psychometrically sound questionnaire was developed, tested, and validated in a large longitudinal German sample. Importantly, a positive relationship with eating was associated with healthier eating and a decreased health risk measured by objective health parameters six months later, pointing to a health protective role. Moreover, the structure of the PES was confirmed in additional samples from Germany, India and the USA, indicating validity across remarkably different eating environments.

In conclusion, a positive relationship with eating might be a fruitful starting point for prevention and intervention programmes to promote physical and psychological health. For instance, interventions to promote intuitive eating, that is, eating by internal cues, have shown promising results in terms of changeability of intuitive eating and its effect on physical and psychological health (see Schaefer & Magnuson, 2014 for a review). Further research is needed to develop and test such interventions enhancing people's positive relationship with eating. This might be a further step towards returning to food and eating as a major source of pleasure instead of a source of worry and concern.

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Notes

1. Please note that logistic regression has the great advantage that it can handle non-metric data, does neither require homoscedasticity nor linearity, and can render diverging results in comparison to linear regression (for discussion, please see Tabachnick & Fidell, 2014). Please also note that, when predicting health risk status, the risk status categories mostly do not have equal cells sizes as categories are based on theoretical considerations (e.g. a cut-off of 150 mg/dL for triglycerides).
2. Please note that retest reliability is associated with a slightly lower cut-off value than internal consistency and needs to be interpreted in relation to the time lag between the two repeated assessments.

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